

Arabidopsis thaliana FAE1 (SEQ ID NO:2)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
RKTFAASREE TEKVIIGALE NLFENTKVNP REIGILVNS SMFNPTPSLS
AMVVNTFKLR SNIKSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
ENITQGIYAG ENRSMMSVNC LFRVGGAAIL LSNKSGDRRR SKYKLVHTVR
THTGADDKSF RCVQQEDDES GKIGVCLSKD ITNVAGTTLT KNIATLGPLI
LPLSEKFLFF ATFVAKKLLK DKIKHYYPVD FKLAVDHFCI HAGGRAVIDE
LEKNLGLSPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGKNAW
QIALGSGFKC NSAVWVALRN VKASANSWPQ HCIDRYPVKI DSDLSSKSKTH
VQNGRS

Brassica napus elongase KCS (SEQ ID NO:4)

MTSINVKLLY HYVITNLFNL CFFPLTAIVA GKAYRLTIDD LHHLYYSYLQ
HNLITIAPLF AFTVFGSVLY IATRPKPVYL VEYSCYLPPT HCRSSISKVM
DIFYQVRKAD PSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVNS SMFNPTPSLS
AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
LPLSEKLLFF VTFMGKKLFF DKIKHYYPVD FKLADHFCI HAGGRAVIDV
LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGKKNVW
QIALGSGFKC NSAVWVALNN VKASTNSPWE HCIDRYPVKI DSDSGKSETR
VQNGRS

B. napus elongase KCS (SEQ ID NO:6)

MTSINVKLLY HYVITNLFNL CFFPLTAIVA GKAYLTIDDL HHLYYSYLQH
NLITIAPLLA FTVFGSVLYI ATRPKPVYLV EYSCYLPPTH CRSSISKVMD
IFFQVRKADP SRNGTCDDSS WLDFLRKIQE RSGLGDETHG PEGLLQVPPR
KTFARAREET EQVIIGALEN LFKNTNVNPK DIGILVNSS MFNPTPSLSA
MVVNTFKLRS NVRSFNLGGM GCSAGVIAID LAKDLLHVHK NTYALVVSTE
NITYNIYAGD NRSMMVSNC LFRVGGAAIL SNKPRDRRRS KYELVHTVRT
HTGADDKSFR CVQQGDDENG QTGVSLSKDI TDVAGRTVKK NIATLGPLIL
PLSEKLLFFV TFMGKKLFD EIKHYYPDF KLADHFCIH AGGKAVIDVL
EKNLGLAPID VEASRSTLHR FGNTSSSIW YELAYIEPKG RMKKGNKVWQ
IALGSGFKCN SAVWVALNNV KASTNSPWEH CIDRYPVKID SDSGKSETRV
PNGRS

FIGURE 1-1

At114 (SEQ ID NO:8)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
 IFYQIRKADT SSRNGTCDD S WLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYYPVD FKLAIDHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGKNKVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCIDRYPVKI DSDSGKSETR
 VPNGRS

At74 (SEQ ID NO:10)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPKPVYLV EYSCYLPPTH CRSSISKVMD
 IFYQVRKADP SRNGTCDDSS WLDFLRKIQE RSGLGDETHG PEGLLQVPPR
 KTFAAAREET EQVIIGALEN LFKNTNVNPK DIGILVVNSS MFNPTPSLSA
 MVVNTFKLRS NVRSFNLGGM GCSAGVIAID LAKDLLHVHK NTYALVVSTE
 NITYNIYAGD NRSMMVSNCL FRVGGAAILL SNKPGDRRRS KYELVHTVRT
 HTGADGKSFR CVQQGDDENG KIGVSLSKDI TDVAGRTVKK NIATLGPLIL
 PLSEKLLFFV TFMGKKLFFD KIKHYYPVDF KLAIDHFCIH AGGRAVIDVL
 EKNLALAPID VEASRSTLHR FGNTSSSSIW YELAYIEAKG RMKKGNKVWQ
 IALGSGFKCN SAVWVALNNV KASTNSPWEH CIDRYPVKID SDSGKSETRV
 QNGRS

At114 L91C K92R (SEQ ID NO:12)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH **CRVSVSKVMD**
 IFYQIRKADT SSRNGTCDNS WLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYYPVD FKLAIDHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGKNKVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCIDRYPVKI DSDSGKSETR
 VPNGRS

FIGURE 1-2

At114 K92R (SEQ ID NO:14)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH **L**RVS~~V~~SKVMD
 IFYQIRKADT SSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYVPD FKLAIHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGKQVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VPNGRS

At114 G307D (SEQ ID NO:16)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVS~~V~~SKVMD
 IFYQIRKADT SSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGAD**D**KSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYVPD FKLAIHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGKQVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VQNGRS

At74 G306D (SEQ ID NO:18)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPKPVYLV EYSCYLPPTH CRSSISKVMD
 IFYQVRKADP SRNGTCDDSS WLD~~F~~LRKIQE RSGLGDETHG PEGLLQVPPR
 KTFAAAREET EQVIIGALEN LFKNTNVNPK DIGILVVNSS MFNPTPSLSA
 MVVNTFKLRS NVRSFNLGGM GCSAGVIAID LAKDLLHVHK NTYALVVSTE
 NITYNIYAGD NRSMMSVNC LFRVGGAAIL LSNKPGDRRRS KYELVHTVRT
 HTGAD**D**KSFR CVQQGDDENG KIGVSLSKDI TDVAGRTVKK NIATLGPLIL
 PLSEKLLFFV TFMGKKLFFD KIKHYVPDF KLAIDHFCIH AGGRAVIDVL
 EKNLALAPID VEASRSTLHR FGNTSSSSIW YELAYIEAKG RMKKKGKQVWQ
 IALGSGFKCN SAVWVALNNV KASTNSPWEH CIDRYPVKID SDSGKSETRV
 QNGRS

FIGURE 1-3

At114 L91C K92R G307D (SEQ ID NO:20)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH **CR**VSVSKVMD
 IFYQIRKADT SSRNGTCDNS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGAD**DK**SF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFK DKIKHYVVPD FKLAI DHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKQVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VQNGRS

At114 K92R G307D (SEQ ID NO:22)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH **LR**VSVSKVMD
 IFYQIRKADT SSRNGTCDNS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGAD**DK**SF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFK DKIKHYVVPD FKLAI DHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKQVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VQNGRS

At254 (SEQ ID NO:24)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNLLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
 IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
 RKTFAASREE TEKVIIGALE NLFENTKVNPN REIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNIKSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFK DKIKHYVVPD FKLAI DHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKQVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VPNGRS

FIGURE 1-4

At173 (SEQ ID NO:26)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
 IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
 RKTFAASREE TEKVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMSVNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLKF DKIKHYYPVD FKLAIDHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGNKVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCIDRYPVKI DSDSGKSETR
 VQNGRS

Bn176 (SEQ ID NO:28)

MTSINVKLLY HYVITNLFNL CFFPLTAIVA GKAYRLTIDD LHHLYYSYLQ
 HNLITIAPLF AFTVFGSVLY IATRPKPVYL VEYSCYLPPT HCRSSISKVM
 DIFYQVRKAD PSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTKVNP REIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNIKSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITQGIYAG ENRSMMSVNC LFRVGGAAIL LSNKSGDRRR SKYKLVHTVR
 THTGADDKSF RCVQQEDDES GKIGVCLSKD ITNVAGTTLT KNIATLGPLI
 LPLSEKFLFF ATFVAKKLLK DKIKHYYPVD FKLAVDHFCI HAGGRAVIDE
 LEKNLGLSPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGNKAW
 QIALGSGFKC NSAVWVALRN VKASANSWPQ HCIDRYPVKI DSDLSKSKTH
 VQNGRS

At399 (SEQ ID NO:30)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
 IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
 RKTFAASREE TEKVIIGALE NLFENTKVNP REIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNIKSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITQGIYAG ENRSMMSVNC LFRVGGAAIL LSNKSGDRRR SKYKLVHTVR
 THTGADDKSF RCVQQEDDES GKIGVCLSKD ITNVAGTTLT KNIATLGPLI
 LPLSEKFLFF ATFVAKKLLK DKIKHYYPVD FKLAVDHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMKKGNKVW
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCIDRYPVKI DSDSGKSETR
 VQNGRS

FIGURE 1-5

Bn399 (SEQ ID NO:32)

MTSINVKLLY HYVITNLFNL CFFPLTAIVA GKAYRLTIDD LHHLYYSYLQ
HNLITIAPLF AFTVFGSVLY IATRPKPVYL VEYSCYLPPT HCRSSISKVM
DIFYQVRKAD PSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
THTGADGKSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
LPLSEKLLFF VTFMGKKLKF DKIKHYYPV FKLAI DHFCI HAGGRAVIDE
LEKNLGLSPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKAW
QIALGSGFKC NSAVWVALRN VKASANSPWQ HCIDRYPVKI DSDLSKSKTH
VQNGRS

Bn G307D (SEQ ID NO:34)

MTSINVKLLY HYVITNLFNL CFFPLTAIVA GKAYRLTIDD LHHLYYSYLQ
HNLITIAPLF AFTVFGSVLY IATRPKPVYL VEYSCYLPPT HCRSSISKVM
DIFYQVRKAD PSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
THTGAD**D**KSF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
LPLSEKLLFF VTFMGKKLKF DKIKHYYPV FKLAI DHFCI HAGGRAVIDV
LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKVW
QIALGSGFKC NSAVWVALNN VKASTNSPWE HCIDRYPVKI DSDSGKSETR
VQNGRS

At K92R (SEQ ID NO:36)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH **L**RVSVSKVMD
IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
RKTFAASREE TEKVIIGALE NLFENTKVNP REIGILVVNS SMFNPTPSLS
AMVVNTFKLR SNIKSFNLGG MGCSAGVIAI DLAKDLLHVH KNTYALVVST
ENITQGIYAG ENRSMMVSNC LFRVGGAAIL LSNKSGDRRR SKYKLVHTVR
THTGAD**D**KSF RCVQQEDDES GKIGVCLSKD ITNVAGTTLT KNIATLGPLI
LPLSEKFLFF ATFVAKKLLK DKIKHYYPV FKLAVDHFCI HAGGRAVIDE
LEKNLGLSPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKAW
QIALGSGFKC NSAVWVALRN VKASANSPWQ HCIDRYPVKI DSDLSKSKTH
VQNGRS

FIGURE 1-6

At254 G307D (SEQ ID NO:38)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
 IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
 RKTFAASREE TEKVIIGALE NLFENTKVNP REIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNIKSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGAD**DK**SF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYYPV FKLAI DHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKVV
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VQNGRS

At173 G307D (SEQ ID NO:40)

MTSVNVKLLY RYVLTNFFNL CLFPLTAFLA GKASRLTIND LHNFLSYLQH
 NLITVTLLFA FTVFGLVLYI VTRPNPVYLV DYSCYLPPPH LKVSVSKVMD
 IFYQIRKADT SSRNVACDDP SSLDFLRKIQ ERSGLGDETY SPEGLIHVPP
 RKTFAASREE TEKVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGAD**DK**SF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYYPV FKLAI DHFCI HAGGRAVIDV
 LEKNLALAPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKVV
 QIALGSGFKC NSAVWVALNN VKASTNSPWE HCDRYPVKI DSDSGKSETR
 VQNGRS

Bn399 G307D (SEQ ID NO:42)

MTSINVKLLY HYVITNLFNL CFFPLTAIVA GKAYRLTIDD LHHLYYSYLO
 HNLITIAPLF AFTVFGSVLY IATRPKPVYL VEYSCYLPPT HCRSSISKVM
 DIFYQVRKAD PSRNGTCDDS SWLDFLRKIQ ERSGLGDETH GPEGLLQVPP
 RKTFAAAREE TEQVIIGALE NLFKNTNVNP KDIGILVVNS SMFNPTPSLS
 AMVVNTFKLR SNVRSFNLGG MGCSAGVIAI DLAkdLLHVH KNTYALVVST
 ENITYNIYAG DNRSMMVSNC LFRVGGAAIL LSNKPGDRRR SKYELVHTVR
 THTGAD**DK**SF RCVQQGDDEN GKIGVSLSKD ITDVAGRTVK KNIATLGPLI
 LPLSEKLLFF VTFMGKKLFF DKIKHYYPV FKLAI DHFCI HAGGRAVIDE
 LEKNLGLSPI DVEASRSTLH RFGNTSSSSI WYELAYIEAK GRMCKGNKAW
 QIALGSGFKC NSAVWVALRN VKASANSWPQ HCDRYPVKI DSDLSKSKTH
 VQNGRS

FIGURE 1-7

Arabidopsis thaliana FAE1 (SEQ ID NO:1)

atgacgtccg ttaacgttaa gtccttttac cgttacgtct taaccaactt
tttcaacctc tgtttggtcc cgtaaaccgc gttcctcgcc ggaaaagcct
ctcgggttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
gttaccttcc accaccgcat ctcaaagtta gtgtctctaa agtcatggat
atthttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
tgatgatccg tcctcgctcg atttcctgag gaagattcaa gagcgttcag
gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
cggaagactt ttgcagcgtc acgtgaagag acagagaagg ttatcatcgg
tgcgctcgaa aatctattcg agaacaccaa agttaaccct agagagattg
gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc
gctatggctg ttaatacttt caagctccga agcaacatca aaagctttaa
tctaggagga atgggttgta gtgctggtgt tattgccatt gatttggtta
aagacttggt gcatgttcat aaaaacactt atgctcttgt ggtgagcact
gagaacatca cacaaggcat ttatgctgga gaaaatagat caatgatggt
tagcaattgc ttgtttcgtg ttgggtggggc cgcgattttg ctctctaaca
agtcggggaga cgggagacgg tccaagtaca agctagttca cacggtcgga
acgcatactg gagctgatga caagtctttt cgatgtgtgc aacaagaaga
cgatgagagc ggcaaaatcg gagtttgtct gtcaaaggac ataaccaatg
ttgcggggac aacacttacg aaaaatatag caacattggg tccgttgatt
cttcctttta gcgaaaagt tctttttttc gctaccttcg tcgccaagaa
acttctaaag gataaaatca agcattacta tgttccggat ttcaagcttg
ctgttgacca tttctgtatt catgccggag gcagagccgt gatcgatgag
ctagagaaga acttaggact atcgccgac gatgtggagg catctagatc
aacgtttacat agatttgga atacttcac tagctcaatt tggatgaat
tagcatacat agaggcaaag ggaagaatga agaaaggga taaagcttgg
cagattgctt taggatcagg gttaagtgt aatagtgcgg ttgggtggc
tctacgcaat gtcaaggcat cggcaaata tagcttgcaa cattgcatcg
atagatatcc ggttaaaatt gattctgatt tgtcaaagtc aaagactcat
gtccaaaacg gtcggtccta atttgatgta tctgagtgc aacgtttact
ttgtctttcc tttcttttat tggttatgaa ttagatgttt actaatgttc
ctctcttttt cgttataaat aaagaagttc aattcttct atagtttcaa
acgcgatttt aagcgtttct atttaggttt acatgaattt cttttacaaa
ccatctttt

FIGURE 2-1

Brassica napus elongase KCS (SEQ ID NO:3)

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atgacgtcca ttaacgtaaa gtccttttac cattacgtca taaccaacct
tttcaacctt tgcttctttc cgtaaacggc gatcgtcgcc ggaaaagcct
atcgggttac catagacgat cttcaccact tatactattc ctatctccaa
cacaacctca taaccatcgc tccactcttt gccttcaccg ttttcggttc
ggttctctac atcgcaaccc ggcccaaacc ggtttacctc gttgagtact
catgctacct tccaccaacg cattgtagat caagtatctc caaggtcatg
gatatctttt atcaagtaag aaaagctgat ccttctcgga acggcacgtg
cgatgactcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
gtctaggcga tgaaactcac gggcccgagg ggctgcttca ggtccctccc
cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
tgcgctagaa aatctattca agaacaccaa cgtaaaccct aaagatatag
gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
gagaacatca cttataacat ttacgctggg gataataggt ccatgatggg
ttcaaattgc ttgttccgtg ttgggtgggg cgctattttg ctctccaaca
agcctggaga tcgtagacgg tccaagtacg agctagtcca cacggttcga
acgcataccg gagctgacgg caagtctttt cgttgcgtgc aacaaggaga
cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
ttgctggctg aacggttaag aaaaacatag caacgttggg tccgttgatt
cttccgttaa gcgagaaaact tctttttttc gttaccttca tgggcaagaa
acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
aacgttacat agatttgga acacttcac tagctcaata tggatgagt
tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
gtccaaaacg gtcggtccta ataa

```

FIGURE 2-2

B. napus elongase KCS (SEQ ID NO:5)

tagagcgtaa	cggaccacaa	aagaggatcc	atacaaatac	atctcatcgc
ttccattact	attctccgac	acacacactg	agcaatgacg	tccattaacg
taaagctcct	ttaccattac	gtcataacca	accttttcaa	cctttgtttc
tttccattaa	cggcgatcgt	cgccggaaaa	gcctatctta	ccatagacga
tcttcaccac	ttatactatt	cctatctcca	acacaacctc	ataaccattg
ctccactctt	ggccttcacc	gttttcgggt	cggttctcta	catcgcaacc
cggcccaaac	cggtttacct	cgtggagtac	tcatgctacc	ttccaccaac
gcattgtaga	tcaagtatct	ccaaggatcat	ggatatcttt	ttccaagtaa
gaaaagctga	tccttctcgg	aacggcacgt	gcatgactc	gtcctggcct
gacttcttga	ggaagattca	agaacgttca	ggtctaggcg	atgaaaccca
cgggcccag	gggctgcttc	aggtccctcc	ccggaagact	tttgcgcgcg
cgcgtgaaga	gacggagcaa	gttatcattg	gtgcgctaga	aaatctattc
aagaacacca	atgttaaccc	taaagatata	ggtatacttg	tggtgaactc
aagcatgttt	aatccaactc	cttcgctctc	cgcgatggtc	gttaacactt
tcaagctccg	aagcaacgta	agaagcttta	accttggtgg	catgggttgt
agtgccggcg	ttatagccat	tgatctagca	aaggacttgt	tgcatgtcca
taaaaatacg	tatgctcttg	tggtgagcac	agagaacatc	acttataaca
tttacgctgg	tgataatagg	tccatgatgg	tttcaaattg	cttggtccgt
gttggtgggg	ccgctatttt	gctctccaac	aagcctagag	atcgtagacg
gtccaagtac	gagctagttc	acacggttcg	aacgcatacc	ggagctgacg
acaagtcttt	tcgttgctgt	caacaaggag	acgatgagaa	cggccaaacc
ggagtgagtt	tgtccaagga	cataaccgat	gttgctggtc	gaacggttaa
gaaaaacata	gcaacgctgg	gtccgttgat	tcttccgtta	agcgagaaac
ttcttttttt	cgttaccttc	atgggcaaga	aacttttcaa	agacgaaatc
aaacattatt	acgtcccgga	cttcaagctt	gctatcgacc	atttttgtat
acatgccgga	ggcaaagccg	tgattgatgt	gctagagaag	aacctaggcc
tagcaccgat	cgatgtagag	gcatcaagat	caacgttaca	tagattttgga
aacacttcat	ctagctcaat	atgggtatgag	ttggcataca	tagaaccocaa
aggaaggatg	aagaaaggta	ataaagtgtg	gcagattgct	ttaggggtcag
gctttaagtg	taacagtgca	gtttgggtgg	ctctaaacaa	tgtcaaagct
tcaacaaata	gtccttgagg	acactgcata	gacagatacc	cggttaaaat
tgattctgat	tcaggtaagt	cagagactcg	tgtcccaaac	ggtcggtcct
aataaatgat	gtttgctctc	tttcgtttct	ttttattggg	tataataatt
tgatggccac	gatgtttctc	ttgtttgtta	tgaataaaga	atcccacggt
gttctagtaa	aaaaaaaaaa	aaaaaaaaaa	aaaaaa	

FIGURE 2-3

At114 (SEQ ID NO:7)

atgacgtccg ttaacgttaa gtccttttac cgttatgtct taaccaactt
 tttcaacctc tgtttggtcc cgtaaacggc gttcctcgcc ggaaaagcct
 ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc gccaccgcat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acggcacgtg
 tgatgattcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
 gtctaggcga tgaaactcac gggcccagg ggctgcttca ggtccctccc
 cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
 tgcgctagaa aatctattca agaacaccaa cgtaaacctt aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
 gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgctggt gataatagggt ccatgatggt
 ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataccg gagctgacgg caagtctttt cgttgcgtgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggctg aacggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgttacat agatttgga acacttcac tagctcaata tggatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
 cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtcccaaacg gtcggtccta a

FIGURE 2-4

At74 (SEQ ID NO:9)

```

atgacgtccg ttaacggttaa gtccttttac cgttacgtct taaccaactt
tttcaacctc tgtttggtcc cgtaaacggc gttcctcgcc ggaaaagcct
ctcgggttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
tctctacatc gtaacccgac ccaaaccggt ttacctcggt gagtactcat
gctaccttcc accaacgcat tgtagatcaa gtatctccaa ggatcatggat
atcttttata aagtaagaaa agctgatcct tctcggaacg gcacgtgcga
tgactcgctg tggcttgact tcttgaggaa gattcaagaa cgttcaggtc
taggcgatga aactcacggg cccgaggggc tgcttcagggt ccctcccggg
aagacttttg cggcggcgcg tgaagagacg gagcaagtta tcattggtgc
gctagaaaat ctattcaaga acaccaacgt taaccctaaa gatataggta
tacttggtgt gaactcaagc atgtttaatc caactccatc gctctccgcg
atggctcgta acactttcaa gctccgaagc aacgtaagaa gctttaacct
tggtggcatg ggttgtagtg ccggcggtat agccattgat ctagcaaagg
acttggtgca tgtccataaa aatacgtatg ctcttggtgt gagcacagag
aacatcactt ataacattta cgctggtgat aataggtcca tgatggtttc
aaattgcttg ttccgtggtg gtggggcgcg tattttgctc tccaacaagc
ctggagatcg tagacggtcc aagtacgagc tagttcacac ggttcgaacg
cataccggag ctgacggcaa gtcttttcgt tgcgtgcaac aaggagacga
tgagaacggc aaaatcggag tgagtttgct caaggacata accgatgttg
ctggtcgaac ggtaagaaa aacatagcaa cgttgggtcc gttgattctt
ccgttaagcg agaaacttct ttttttcggt accttcattg gcaagaaact
tttcaaagat aaaatcaaac attactacgt cccggatttc aaacttgcta
ttgaccattt ttgtatacat gccggaggca gagccgtgat tgatgtgcta
gagaagaacc tagccctagc accgatcgat gtagaggcat caagatcaac
gttacataga tttggaaaca ctcatctag ctcaatatgg tatgagttgg
catacataga agcaaaagga aggatgaaga aaggtaataa agtttggcag
attgcttttag ggtcaggctt taagtgtaac agtgcagttt ggggtggctct
aaacaatgtc aaagcttcga caaatagtc ttgggaacac tgcatcgaca
gatacccggt caaaattgat tctgattcag gtaagtcaga gactcgtgtc
caaaacggtc ggtcctaa

```

FIGURE 2-5

At114 L91C K92R (SEQ ID NO:11)

```

atgacgtccg ttaacgttaa gtccttttac cgttatgtct taaccaactt
tttcaacctc tgtttggtcc cgtaaaccgc gttcctcgcc ggaaaagcct
ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
tctctacatc gtaacccgac ccaatccggt ttatctcggt gactactcgt
gttaccttcc gccaccgcat tgacaggtta gtgtctctaa agtcatggat
atcttctacc aaataagaaa agctgatact tcttcacgga acggcacgtg
tgataattcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
gtctaggcga tgaaactcac gggcccagag ggctgcttca ggtccctccc
cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
tgcgctagaa aatctattca agaacaccaa cgttaaccct aaagatatag
gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
gagaacatca cttataacat ttacgctggg gataatagggt ccatgatggg
ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
agcctggaga tcgtagacgg tccaagtacg agctagttca cacgggtcga
acgcataacc gagctgacgg caagtctttt cgttgcgtgc aacaaggaga
cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
ttgctggctg aacgggttaag aaaaacatag caacgttggg tccgttgatt
cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
aacgtttacat agatttgga acacttcac tagctcaata tggatgagt
tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
cagattgctt tagggtcagg cttaagtgt aacagtgcag tttgggtggc
tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
gtcccaaacg gtcggtccta a

```

FIGURE 2-6

At114 K92R (SEQ ID NO:13)

```

atgacgtccg ttaacgttaa gtccttttac cgttatgtct taaccaactt
tttcaacctc tgtttggtcc cgtaaacggc gttcctcgcc ggaaaagcct
ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actcttttgct ttcactgttt tcggtttggt
tctctacatc gtaacccgac ccaatccggt ttatctcggt gactactcgt
gttaccttcc gccaccgcat ctcagaggtta gtgtctctaa agtcatggat
atcttctacc aaataagaaa agctgatact tcttcacgga acggcacgtg
tgatgattcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
gtctaggcga tgaaactcac gggcccagg ggctgcttca ggccctccc
cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
tgcgctagaa aatctattca agaacaccaa cgtaaacctt aaagatatag
gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
gcatggtcgt ttaacacttt caagctccga agcaacgtaa gaagctttaa
ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
gagaacatca cttataacat ttacgctggg gataataggc ccatgatggg
ttcaaattgc ttgttccgtg ttggtggggc cgctatcttg ctctccaaca
agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
acgcataacc gagctgacgg caagtctttt cgttgcgtgc aacaaggaga
cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
ttgctggtcg aacgggttaag aaaaacatag caacgttggg tccgttgatt
cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
aacgttacat agatttgga acacttcac tagctcaata tggatgagt
tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
gtcccaaacg gtcggtccta a

```

FIGURE 2-7

At114 G307D (SEQ ID NO:15)

atgacgtccg ttaacggttaa gtccttttac cgttatgtct taaccaactt
 tttcaacctc tgtttgttcc cgtaaacggc gttcctcgcc ggaaaagcct
 ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
 aacettataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaacccgac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc gccaccgcat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acggcacgtg
 tgatgattcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
 gtctaggcga tgaaactcac gggcccagg ggctgcttca ggtccctccc
 cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
 tgcgctagaa aatctattca agaacaccaa cgtaaccct aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
 gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgctggg gataatagggt ccatgatggg
 ttcaaattgc ttgttccgtg ttgggtgggg cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataacc gagctgacga caagtctttt cgttgcgtgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggctg aacgggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgtttacat agatttgga acacttcac tagctcaata tggatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttg
 cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtccaaaacg gtcggtccta a

FIGURE 2-8

At74 G306D (SEQ ID NO:17)

```

atgacgtccg ttaacgttaa gtccttttac cgttacgtct taaccaactt
tttcaacctc tgtttggtcc cgttaacggc gttcctcgcc ggaaaagcct
ctcggcttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actctttgct ttcactgttt tcgggttggt
tctctacatc gtaaccgcac ccaaaccggt ttacctcggt gagtactcat
gctaccttcc accaacgcat tgtagatcaa gtatctccaa ggtcatggat
atcttttatc aagtaagaaa agctgatcct tctcggaacg gcacgtgcga
tgactcgctc tggcttgact tcttgaggaa gattcaagaa cgttcaggtc
taggcgatga aactcacggg cccgaggggc tgcttcagggt cctccccggg
aagacttttg cggcggcgcg tgaagagacg gagcaagtta tcattggtgc
gctagaaaat ctattcaaga acaccaacgt taaccctaaa gatataggta
tacttggtgt gaactcaagc atgtttaatc caactccatc gctctccgcg
atgggtcgta acactttcaa gtcctgaagc aacgtaagaa gctttaacct
tggtggcatg ggttgtagtg ccggcggtat agccattgat ctagcaaagg
acttggtgca tgtccataaa aatacgtatg ctcttggtgt gagcacagag
aacatcactt ataacattta cgctggtgat aatagggtcca tgatggtttc
aaattgcttg ttccgtggtg gtggggccgc tattttgctc tccaacaagc
ctggagatcg tagacggtcc aagtacgagc tagttcacac gggtcgaacg
cataccggag ctgacgacaa gtcttttcgt tgcgtgcaac aaggagacga
tgagaacggc aaaatcggag tgagtttgct caaggacata accgatgttg
ctggtcgaac ggttaagaaa aacatagcaa cgttgggtcc gttgattctt
ccgtaagcg agaaacttct ttttttcggt accttcattg gcaagaaact
tttcaaagat aaaatcaaac attactacgt cccggatttc aaacttgcta
ttgaccattt ttgtatacat gccggaggca gagccgtgat tgatgtgcta
gagaagaacc tagccctagc accgatcgat gtagaggcat caagatcaac
gttacataga tttggaaaca cttcatctag ctcaatatgg tatgagttgg
catacataga agcaaaagga aggatgaaga aaggtaataa agtttggcag
attgcttttag ggtcagggtt taagtgtaac agtgcagttt gggtaggtct
aaacaatgtc aaagcttcga caaatagtcc ttgggaacac tgcacgcaca
gatacccggt caaaattgat tctgattcag gtaagtcaga gactcgtgtc
caaaacggtc ggtcctaa

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FIGURE 2-9

At114 L91C K92R G307D (SEQ ID NO:19)

```

atgacgtccg ttaacgttaa gtccttttac cgttatgtct taaccaactt
tttcaacctc tgtttggtcc cgtaacggc gttcctcgcc ggaaaagcct
ctcgggttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actctttgct ttcactgttt tcgggttggt
tctctacatc gtaacccgac ccaatccggt ttatctcggt gactactcgt
gttaccttcc gccaccgcat tgacagagtta gtgtctctaa agtcatggat
atcttctacc aaataagaaa agctgatact tcttcacgga acggcacgtg
tgataattcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
gtctaggcga tgaaactcac gggcccgagg ggctgcttca ggtccctccc
cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
tgcgctagaa aatctattca agaacaccaa cgtaaacctt aaagatatag
gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
gcgatggtcg ttaacacttt caagctccga agcaacgtaa gaagctttta
ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
gagaacatca cttataacat ttacgctggt gataataggt ccatgatggt
ttcaaattgc ttgttccgtg ttggtggggc cgctatcttg ctctccaaca
agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
acgcataacc gagctgacga caagctctttt cgttgcgtgc aacaaggaga
cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
ttgctggtcg aacgggttaag aaaaacatag caacgttggg tccgttgatt
cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
aacgttacat agatttgga acacttcac tagctcaata tggatgagt
tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
cagattgctt tagggtcagg cttaagtgt aacagtgcag tttgggtggc
tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcacgc
acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
gtccaaaacg gtcggtccta a

```

FIGURE 2-10

At114 K92R G307D (SEQ ID NO:21)

atgacgtccg ttaacgttaa gtccttttac cgttatgtct taaccaactt
 tttcaacctc tgtttggtcc cgtaacggc gttcctcgcc ggaaaagcct
 ctgggcttac cataaacgat ctccacaact tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaacccgac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc gccaccgcat ctc**agag**gtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acggcacgtg
 tgatgattcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
 gtctaggcga tgaaactcac gggcccagg ggctgcttca ggccctccc
 cgaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
 tgcgctagaa aatctattca agaacaccaa cgtaaacctt aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
 gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgctggt gataataggt ccatgatggt
 ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagtcca cacggttcga
 acgcataacc gagctgacga **ca**agctctttt cgttgcgtgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggctg aacgggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgttacat agatttgga acacttcac tagctcaata tggatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttg
 cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtccaaaacg gtcggtccta a

FIGURE 2-11

At254 (SEQ ID NO:23)

atgacgtccg ttaacgtaa gtccttttac cgttacgtct taaccaactt
 tttcaacctc tgtttggtcc cgtaacggc gttcctcgcc ggaaaagcct
 ctgggttac cataaacgat ctccacaacc tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaacccgac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc accaccgcat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
 tgatgatccg tcctcgctcg atttcctgag gaagattcaa gagcgttcag
 gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
 cggagactt ttgcagcgtc acgtgaagag acagagaagg ttatcatcgg
 tgcgctcgaa aatctattcg agaacaccaa agttaaccct agagagattg
 gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc
 gctatggctg ttaatacttt caagctccga agcaacatca aaagctttaa
 tctaggagga atgggttgta gtgctggtgt tattgccatt gatttggtca
 aagacttggt gcatgttcat aaaaacactt atgctctcgt ggtgagcaca
 gagaacatca cttataacat ttacgtgggt gataataggt ccatgatggt
 ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttoga
 acgcataccg gagctgacgg caagtctttt cgttgcggtc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggctg aacggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggtt ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgtttacat agatttgga acacttcac tagctcaata tggatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
 cagattgctt tagggtcagg cttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtcccaaacg gtcggtccta a

FIGURE 2-12

At173 (SEQ ID NO:25)

atgacgtccg ttaacggttaa gtccttttac cgttacgtct taaccaactt
 tttcaacctc tgtttggtcc cgtaaacggc gttcctcgcc ggaaaagcct
 ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc accaccgcat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
 tgatgatccg tcctcgctcg atttcctgag gaagattcaa gagcggtcag
 gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
 cggaagactt ttgcagcgct acgtgaagag acagagaagg ttatcatcgg
 tgcgctcgaa aatctattca agaacaccaa cgtaaacctt aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
 gcgatggtcg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttgtt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgtggtt gataataggt ccatgatggt
 ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataccg gagctgacgg caagtctttt cgttgcgtgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggtcg aacggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggtt ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgttacat agatttgga acacttcac tagctcaata tggatatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
 cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcacgc
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtccaaaacg gtcggtccta a

FIGURE 2-13

Bn176 (SEQ ID NO:27)

atgacgtcca ttaacgtaaa gtccttttac cattacgtca taaccaacct
 tttcaacctt tgcttctttc cgtaaacggc gatcgctgcc ggaaaagcct
 atcggcttac catagacgat cttcaccact tatactattc ctatctccaa
 cacaacctca taaccatcgc tccactcttt gccttcaccg ttttcggttc
 ggttctctac atcgcaaccc ggcccaaacc ggtttacctc gttgagtact
 catgctacct tccaccaacg cattgtagat caagtatctc caaggctcatg
 gatattcttt atcaagtaag aaaagctgat ccttctcgga acggcacgtg
 cgatgactcg tcgtaggctg acttcttgag gaagattcaa gaacgttcag
 gtctaggcga tgaaactcac gggcccgagg ggctgcttca ggtccctccc
 cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
 tgcgctagaa aatctattca agaacaccaa agttaaccct agagagattg
gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc
gotatggctg ttaatacttt caagctccga agcaacatca aaagctttaa
tctaggagga atgggttgta gtgctggtgt tattgccatt gatttggcta
aagacttgtt gcatgttcat aaaaacactt atgctcttgt ggtgagcact
gagaacatca cacaaggcat ttatgctgga gaaaatagat caatgatggt
tagcaattgc ttgtttcgtg ttggtggggc cgcgattttg ctctctaaca
agtcgggaga cgggagacgg tccaagtaca agctagttca cacggtccga
acgcatactg gagctgatga caagtctttt cgatgtgtgc aacaagaaga
tgatgagagc ggcaaaatcg gagtttgtct gtcaaaggac ataaccaatg
ttgcggggac aacacttacg aaaaatatag caacattggg tccgttgatt
cttcctttaa gcgaaaagtt tctttttttc gctaccttcg tcgccaagaa
acttctaaag gataaaatca agcattacta tgttccggat ttcaagcttg
ctgttgacca tttctgtatt catgccggag gcagagccgt gatcgatgag
ctagagaaga acttaggact atcgccgac gatgtggagg catctagatc
aacgttacat agatttggga atacttcac tagctcaatt tggatatgaat
tagcatacat agaggcaaag ggaagaatga agaaagggaa taaagcttgg
cagattgctt taggatcagg gtttaagtgt aatagtgcgg tttgggtggc
tctacgcaat gtcaaggcat cggcaaata tagcttgcaa cattgcatcg
atagatatcc ggttaaaatt gattctgatt tgtcaaagtc aaagactcat
gtccaaaacg gtcggtccta a

FIGURE 2-14

At399 (SEQ ID NO:29)

atgacgtccg ttaacgttaa gtccttttac cgttacgtct taaccaactt
 ttccaacctc tgtttgttcc cgtaaacggc gttcctcgcc ggaaaagcct
 ctgggttac cataaacgat ctccacaact tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc accaccgcat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
 tgatgatccg tcctcgctcg atttcctgag gaagattcaa gagcgttcag
 gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
 cggaagactt ttgcagcgtc acgtgaagag acagagaagg ttatcatcgg
 tgcgctcgaa aatctattcg agaacaccaa agttaaccct agagagattg
 gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc
 gctatggctc ttaatacttt caagctccga agcaacatca aaagctttta
 tctaggagga atgggttgta gtgctggtgt tattgccatt gatttggcta
 aagacttgtt gcatgttcat aaaaacactt atgctcttgt ggtgagcact
 gagaacatca cacaaggcat ttatgctgga gaaaatagat caatgatggt
 tagcaattgc ttgtttcgtg ttggtggggc cgcgattttg ctctctaaca
 agtcgggaga cgggagacgg tccaagtaca agctagttca cacgggtccga
 acgcatactg gagctgatga caagtctttt cgatgtgtgc aacaagaaga
 cgatgagagc ggcaaaatcg gagtttgtct gtcaaaggac ataaccaatg
 ttgcggggac aacacttacg aaaaatatag caacattggg tccgttgatt
 cttcctttta gcgaaaagt tctttttttc gctaccttcg tcgccaagaa
 acttctaaag gataaaatca agcattacta tgttccggat ttcaagcttg
 ctgttgacca tttctgtatt catgccggag gcagagccgt gatcgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgttacat agatttggaa acacttcac tagctcaata tggatatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
 cagattgctt tagggtcagg cttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcacgc
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtccaaaacg gtcggtccta a

FIGURE 2-15

Bn399 (SEQ ID NO:31)

atgacgtcca ttaacgttaa gtccttttac cattacgtca taaccaacct
 tttcaacctt tgcttctttc cgtaaaccggc gatcgtcgcc ggaaaagcct
 atcggcttac catagacgat cttcaccact tatactattc ctatctccaa
 cacaacctca taaccatcgc tccactcttt gccttcaccg ttttcggttc
 ggttctctac atcgcaaccc ggcccaaacc ggtttacctc gttgagtact
 catgctacct tccaccaacg cattgtagat caagtatctc caaggtcacg
 gatattctttt atcaagtaag aaaagctgat ccttctcggg acggcacgtg
 cgatgactcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
 gtctaggcga tgaaactcac gggcccgagg ggctgcttca ggtccctccc
 cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
 tgcgctagaa aatctattca agaacaccaa cgttaaccct aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
 gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgtgggt gataataggt ccatgatggg
 ttcaaattgc ttgttccgtg ttgggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataaccg gagctgacgg caagtctttt cgttgcgctgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgaagtt gtccaaggac ataaccgatg
 ttgctggctg aacgggtaag aaaaacatag caacgttggg tccgttgatt
 cttccggtta gcgagaaact tctttttttc gttaccttca tgggcaagaa
 actttttcaa gataaaatca aacattacta cgtcccggat ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gatcgatgag
 ctagagaaga acttaggact atcgccgac gatgtggagg catctagatc
aacgttacat agatttggga atacttcac tagctcaatt tggatatgaat
tagcatacat agaggcaaag ggaagaatga agaaagggaa taaagcttgg
cagattgctt taggatcagg gtttaagtgt aatagtgcgg tttgggtggc
tctacgcaat gtcaaggcat cggcaaatag tccttggcaa cattgcatcg
atagatatcc ggttaaaatt gattctgatt tgtcaaagtc aaagactcat
gtccaaaacg gtcggtccta a

FIGURE 2-16

Bn G307D (SEQ ID NO:33)

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atgacgtcca ttaacgtaaa gtccttttac cattacgtca taaccaacct
tttcaacctt tgcttctttc cgttaacggc gatcgtcgcc ggaaaagcct
atcggcttac catagacgat cttcaccact tatactattc ctatctccaa
cacaacctca taaccatcgc tccactcttt gccttcaccg ttttcggttc
ggttctctac atcgcaaccc ggcccaaacc ggtttacctc gttgagtact
catgctacct tccaccaacg cattgtagat caagtatctc caaggtcatg
gatatctttt atcaagtaag aaaagctgat ccttctcgga acggcacgtg
cgatgactcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
gtctaggcga tgaaactcac gggcccagg ggctgcttca ggtccctccc
cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
tgcgctagaa aatctattca agaacaccaa cgttaaccct aaagatatag
gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
ccttgggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
gagaacatca cttataacat ttacgctggg gataataggt ccatgatggt
ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
acgcataacc gagctgacga caagtccttt cgttgcgtgc aacaaggaga
cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
ttgctggtcg aacggttaag aaaaacatag caacgttggg tccgttgatt
cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
aacgttacat agatttggaa acacttcac tagctcaata tgggtatgagt
tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcatcg
acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
gtccaaaacg gtcggtccta ataa

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FIGURE 2-17

At K92R (SEQ ID NO:35)

atgacgtccg ttaacgttaa gtccttttac cgttacgtct taaccaactt
tttcaacctc tgtttggtcc cgttaacggc gttcctcgcc ggaaaagcct
ctcgggttac cataaacgat ctccacaact tcctttccta tctccaacac
aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
gttaccttcc accaccgat ctc**ag**agtta gtgtctctaa agtcatggat
attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
tgatgatccg tcctcgctcg atttctgag gaagattcaa gagcgttcag
gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
cggaagactt ttgcagcgtc acgtgaagag acagagaagg ttatcatcgg
tgcgctcgaa aatctattcg agaacaccaa agttaaccct agagagattg
gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc
gctatggctg ttaatacttt caagctccga agcaacatca aaagctttaa
tctaggagga atgggttgta gtgctggtgt tattgccatt gatttggtta
aagacttggt gcatgttcat aaaaacactt atgctcttgt ggtgagcact
gagaacatca cacaaggcat ttatgctgga gaaaatagat caatgatggt
tagcaattgc ttgtttcgtg ttggtggggc cgcgattttg ctctctaaca
agtcgggaga cgggagacgg tccaagtaca agctagttca cacggtccga
acgcatactg gagctgatga caagtctttt cgatgtgtgc aacaagaaga
cgatgagagc ggcaaaatcg gagtttgtct gtcaaaggac ataaccaatg
ttgcggggac aacacttacg aaaaatatag caacattggg tccgttgatt
cttcctttaa gcgaaaagt tctttttttc gctaccttcg tcgccaagaa
acttctaaag gataaaatca agcattacta tgttccggat ttcaagcttg
ctgttgacca tttctgtatt catgccggag gcagagccgt gatcgatgag
ctagagaaga acttaggact atcgccgac gatgtggagg catctagatc
aacgttacat agatttggga atacttcac tagctcaatt tggatgaat
tagcatacat agaggcaaag ggaagaatga agaaagggaa taaagcttgg
cagattgctt taggatcagg gtttaagtgt aatagtgcgg tttgggtggc
tctacgcaat gtcaaggcat cggcaaata tagcttgcaa cattgcatcg
atagatatcc ggttaaaatt gattctgatt tgtcaaagtc aaagactcat
gtccaaaacg gtcggtccta atttgatgta tctgagtgcc aacgtttact
ttgtctttcc tttcttttat tggttatgaa ttagatgttt actaatgttc
ctctcttttt cgttataaat aaagaagttc aattcttcct atagtttcaa
acgcgatttt aagcgtttct atttaggttt acatgaattt cttttacaaa
ccatctttt

FIGURE 2-18

At254 G307D (SEQ ID NO:37)

atgacgtccg ttaacggttaa gtccttttac cgttacgtct taaccaactt
 tttcaacctc tggttggtcc cgtaaacggc gttcctcgcc ggaaaagcct
 ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc accaccgcat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
 tgatgatccg tcctcgctcg atttctgag gaagattcaa gagcggtcag
 gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
 cggaaagactt ttgcagcgtc acgtgaagag acagagaagg ttatcatcgg
 tgcgctcgaa aatctattcg agaacaccaa agttaaccct agagagattg
 gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc
 gctatggctg ttaatacttt caagctccga agcaacatca aaagctttaa
 tctaggagga atgggttgta gtgctggtgt tattgccatt gatttggcta
 aagacttgtt gcatgttcat aaaaacactt atgctctcgt ggtgagcaca
 gagaacatca cttataacat ttacgctggt gataataggt ccatgatggt
 ttcaaattgc ttgttcogtg ttggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataccg gagctgacga **ca**agtcctttt cgttgcgctgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggctg aacggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccgat ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcaccgatc gatgtagagg catcaagatc
 aacgtttacat agatttgga acacttcac tagctcaata tggatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttgg
 cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcacgc
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtccaaaacg gtcggtccta a

FIGURE 2-19

At173 G307D (SEQ ID NO:39)

atgacgtccg ttaacgttaa gtccttttac cgttacgtct taaccaactt
 tttcaacctc tgtttggtcc cgttaacggc gttcctcgcc ggaaaagcct
 ctcggttac cataaacgat ctccacaact tcctttccta tctccaacac
 aaccttataa cagtaacttt actctttgct ttcactgttt tcggtttggt
 tctctacatc gtaaccgcac ccaatccggt ttatctcggt gactactcgt
 gttaccttcc accaccgat ctcaaagtta gtgtctctaa agtcatggat
 attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg
 tgatgatccg tcctcgctcg atttctgag gaagattcaa gagcggtcag
 gtctaggtga tgagacgtac agtcctgagg gactcattca cgtaccaccg
 cggaagactt ttgcagcgtc acgtgaagag acagagaagg ttatcatcgg
 tgcgctcgaa aatctattca agaacaccaa cgtaaccct aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgtctctc
 gcgatggtcg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttgtt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgtgtgt gataataggt ccatgatggt
 ttcaaattgc ttgttccgtg ttggtggggc cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataccg gagctgacga **ca**agtccttt cgttgcggtc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgagttt gtccaaggac ataaccgatg
 ttgctggtcg aacggttaag aaaaacatag caacgttggg tccgttgatt
 cttccgttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaacttg
 ctattgacca tttttgtata catgccggag gcagagccgt gattgatgtg
 ctagagaaga acctagccct agcacccatc gatgtagagg catcaagatc
 aacgttacat agatttgga acacttcac tagctcaata tggatgagt
 tggcatacat agaagcaaaa ggaaggatga agaaaggtaa taaagtttg
 cagattgctt tagggtcagg ctttaagtgt aacagtgcag tttgggtggc
 tctaaacaat gtcaaagctt cgacaaatag tccttgggaa cactgcacgc
 acagataccc ggtcaaaatt gattctgatt caggtaagtc agagactcgt
 gtccaaaacg gtcggtccta a

FIGURE 2-20

Bn399 G307D (SEQ ID NO:41)

atgacgtcca ttaacgttaa gtccttttac cattacgtca taaccaacct
 tttcaacctt tgcttctttc cgtaaaccgg gatcgtcgcc ggaaaagcct
 atcggcttac catagacgat cttcaccact tatactattc ctatctccaa
 cacaacctca taaccatcgc tccactcttt gccttcaccg ttttcggttc
 ggttctctac atcgcaaccc ggcccaaacc ggtttacctc gttgagtact
 catgctacct tccaccaacg cattgtagat caagtatctc caaggtcatg
 gatatctttt atcaagtaag aaaagctgat ccttctcgga acggcacgtg
 cgatgactcg tcgtggcttg acttcttgag gaagattcaa gaacgttcag
 gtctaggcga tgaaactcac gggcccagg ggctgcttca ggtccctccc
 cggaagactt ttgcggcggc gcgtgaagag acggagcaag ttatcattgg
 tgcgctagaa aatctattca agaacaccaa cgttaaccct aaagatatag
 gtatacttgt ggtgaactca agcatgttta atccaactcc atcgctctcc
 gcgatggctg ttaacacttt caagctccga agcaacgtaa gaagctttaa
 ccttggtggc atgggttgta gtgccggcgt tatagccatt gatctagcaa
 aggacttggt gcatgtccat aaaaatacgt atgctcttgt ggtgagcaca
 gagaacatca cttataacat ttacgctggg gataataggt ccatgatggt
 ttcaaattgc ttgttccgtg ttgggtgggg cgctattttg ctctccaaca
 agcctggaga tcgtagacgg tccaagtacg agctagttca cacggttcga
 acgcataaccg gagctgacga **ca**agtccttt cgttgcggtgc aacaaggaga
 cgatgagaac ggcaaaatcg gagtgaagtt gtccaaggac ataaccgatg
 ttgctggctg aacgggtaag aaaaacatag caacgttggg tccgttgatt
 ctccggttaa gcgagaaact tctttttttc gttaccttca tgggcaagaa
 acttttcaaa gataaaatca aacattacta cgtcccggat ttcaaaactg
 ctattgacca tttttgtata catgccggag gcagagccgt gatcgatgag
 ctagagaaga acttaggact atcgccgac gatgtggagg catctagatc
aacgttacat agatttggga atacttcac tagctcaatt tggatatgaat
tagcatacat agaggcaaag ggaagaatga agaaagggaa taaagcttgg
cagattgctt taggatcagg gtttaagtgt aatagtgcgg tttgggtggc
tctacgcaat gtcaaggcat cggcaaatag tccttggcaa cattgcatcg
atagatatcc ggttaaaatt gattctgatt tgtcaaagtc aaagactcat
gtccaaaacg gtcggtccta a

FIGURE 2-21